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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,285	11/25/2003	Peter Werner	MAN-013	5573

28661 7590 12/02/2004

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EXAMINER	
HU, SHOUXIANG	
ART UNIT	**PAPER NUMBER**
2811	

DATE MAILED: 12/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/723,285	WERNER ET AL.	
	Examiner	Art Unit	
	Shouxiang Hu	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) *4,5 and 17* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3 and 6-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 November 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *20040405*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Species I in Group I in Paper No. 20040917 is acknowledged. In view of this election, claims 4, 5 and 17 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being unreadable on the elected species, since each of them recites the subject matters concerning a regularly spaced apart islands of germanium, while the elected species of embodiment of Fig. 15 has only randomly spaced apart islands of germaniums.

Accordingly, claims 1-17 are pending in this application; and claims 1-3 and 6-16 remain active.

Information Disclosure Statement

2. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless being cited by the examiner on form PTO-892, references listed in the specification, including the ones in Paragraphs 0006, 0007 and 0085, have not been considered.

Drawings

3. The drawings are objected to because they appear to be informal. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

4. The disclosure is objected to because of the following informalities and/or defects:

In Paragraph 0061, the term of "an additional global minimum at k=0" appears to be in error.

Appropriate correction is required.

Claim Objections

5. Claims 3 and 8 is objected to because of the following informalities and/or defects:

Claim 3 recites the term of "at which the doping density is highest", but fails to clarify definitely which of the recited layers the term of "which" refers to. And, it is not clear that compared with which layers or regions the recited term of "highest" is resulted from. In addition, the term of "at least" should be deleted from the phrase of "and at least one of".

Claim 8 recites the subject matter of "a metal silicide having a silicon lattice structure", but the disclosure lacks an adequate description regarding this subject matter, how and what type of metal silicide can be formed to still have a lattice structure of silicon.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-3 and 6-16, as being best understood in view of the claim objection above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. ("Liu"; Appl. Phys. Lett. Vol. 75, No. 12, September, 1999, pages 1745-1747; of record) in view of Capasso et al. ("Capasso"; US 4,679,061).

Liu discloses a semiconductor structure (Fig. 1; also see particularly the lest and right columns on page 1745) for use in the near infrared region, which naturally including the range from 1.3 to 1.6 microns, comprising: an active zone consisting of a plurality of epitaxially grown alternating layers of Si and Ge (30 periods of Ge quantum dots sandwiched between silicon layers of 6 nm thick with a doping concentration of about $5x10^{18}$ /cm^3), wherein the active zone is located between a base layer (Si) and a cladding layer (Si); and the alternating Si and Ge layers of said active zone form a

superlattice, and holes therein are naturally located in quantized energy levels associated with a valance band and electrons therein are naturally localized in a miniband associated with the conduction band and resulting from the superlattice structure, since the active zone has a structure with a material set substantially the same as the one of the instant invention.

Although Liu does not expressly disclose that the base layer and the cladding layer can be doped with opposite dopants, one of ordinary skill in the art would readily recognize that such base and cladding layers with opposite dopants can be desirably and commonly formed in order to form a functional electrooptical and/or optoelectronic device, as evidenced in Capasso (see the oppositely doped layers 3 and 7 in Fig. 1; also see col. 4, lines 20-22).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the oppositely-doped base and cladding layers of Capasso into the semiconductor structure of Liu, so that a functional electrooptical and/or optoelectronic device would be obtained.

Regarding claim 2, doping inhomogeneity naturally and hence a doping gradient (at least between the Ge and Si layers) naturally exist in the superlattice of Liu since the only the silicon layers are first doped.

Regarding claim 3, at least a lower portion of the cladding layer in the above collectively taught semiconductor structure can be regarded as a barrier layer, because it would be naturally formed of silicon same as that in the instant invention; and also

because the cladding layer is normally heavily doped (as further evidenced in Capasso, see col. 2 ,lines 1 and 2).

Regarding claims 6, 10, 11 and 15, it is noted that the thickness of the Ge layers, the doping concentrations and/or alternating layers in the active zone are all of parameters of importance subject to routine experimentation and optimization. And, they each are respectively well within the art-recognized ranges for them.

Regarding claim 12, it is noted that Sb and P are each art-known for n-type dopants in Si; and, B and In are each art-known for p-type dopants in Si.

Regarding claim 16, it is noted that the thickness of the silicon layers in the active zone is a parameters of importance subject to routine experimentation and optimization. 16. And, it is art-known that thinner silicon layers in the superlattice is desirable in the for further improving overlap of the carrier functions, as evidenced in the prior art such as Eberl et al. (Thin Solid Films, 369 (2000), 33-38; of record; see the paragraph above Fig. 5).

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References B-E are cited as being related to a superlattice semiconductor structure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shouxiang Hu whose telephone number is 571-272-

1654. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SH
November 26, 2004

SHOUXIANG HU
PRIMARY EXAMINER